Flock Wall
Robotic Architectural Environments

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Department of Architecture
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Although today, we are surrounded by smart and networked architectural devices and appliances, they are not considered from and architectural point of view in terms how and when they are used and how they work together. Interactive architecture in general is built on the convergence of embedded computation (intelligence) and a physical counterpart (kinetics) that satisfies adaptation within the contextual framework of human and environmental interaction. The combination of these two areas will allow an environment to have the ability to reconfigure itself and automate physical change to respond, react, adapt, and be interactive. The inherent sensing, processing and output are now beginning to be taken out of the computer and are instead, embedded in the objects of everyday life themselves. The individual devices therefore have a remarkable ability to communicate with each other even while being specifically task oriented. Decentralization then is a powerful control strategy for such systems of individually networked devices (in this case) whereby there is no central control system, and consequentially, the more the system relies on lateral relationships, the less it can rely on overall commands. The beauty of such distributed control is that when it is applied to a large system, there is a potential for emergent behaviour. An emergent behaviour can occur when a number of simple systems operate in an environment that forms more complex behaviours as a collective. The rules of response can be very simple and the rules for interaction between each system can be very simple but the combination can produce interactions that become emergent and very difficult to predict.

Definition of Technical Objectives of the Course

Those taking this course will work collaboratively to design and construct an interactive full-scale 8' tall "Flock Wall". The prototype reconfigurable assembly will be comprised of 36 self-similar robotic modules (birds). The goal is for each module to be able to detect when someone is approaching the wall, change its disposition and flock with the other modules to make a surface. When no one is detected they will disperse and float about making it possible to view through the surface.

In addressing the performance parameters of the prototype, the concept will focus on several key strategies: 1) geometry 2) movement 3) connection 4) scale and 5) embedded intelligence. The final objective of the approach is to create an innovative design that is minimally functional with the capability for evolving additional multi-functionality.

Initially a matrix of various geometries will be explored which will satisfy the other objectives of movement, connection and scale. Primarily the geometric explorations will focus on how the modules can combine with each other to make a surface. Several possibilities of movement will be explored relative to a vertical surface. The scale of the prototype will consist of modules which are approximately 12 inches by 12 inches but will also consider the implications of scale from an architectural perspective. The initial scale is based on the size of the necessary sensing and mechanical parts that will be in each module. Conceptually, the project will feed into a biological paradigm of architectural space-making which will most certainly involve reexamining and adjusting the scale of such modular parts.

In addition to the tectonic objectives, physical prototype will be valuable for several reasons. 1) It will serve as a vehicle for exploring strategies for decentralized control dictating how individual parts of a collective system should behave and how local interactions between individual modules work in terms of forming structures and figuring out how to move them around. 2) It will serve to demonstrate the possibilities of architectural space-making with unprecedented levels of customization and adaptability.

- Learn hands-on robotics for connecting circuits, sensors and motors to kinetic structures
- Understand interactive principles through comprehensive precedent studies
- Understand contextual situations for applications of robotic architectural solutions
- Learn basic mechanical and technological principles of kinetic design
- Understand contemporary ideologies of interactive design
- Prototype a system that can demonstrate (as opposed to simulate) design intention
- Understanding ways to apply modular robotics to dynamic situational activities
  Understand the potential to build robotics into systems that make up architectural space.